

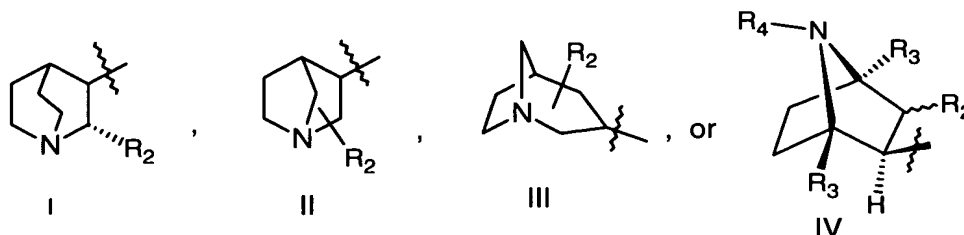
## Claims:

1. A compound of Formula I:



Formula I

- 5 wherein Azabicyclo is



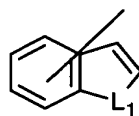
$R_1$  is H;

$R_2$  is H or alkyl;

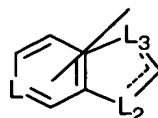
Each  $R_3$  is independently H, alkyl, or substituted alkyl;

- 10  $R_4$  is H, alkyl, an amino protecting group, or an alkyl group having 1-3 substituents selected from F, Cl, Br, I, -OH, -CN, -NH<sub>2</sub>, -NH(alkyl), or -N(alkyl)<sub>2</sub>;

- $R_5$  is 5-membered heteroaromatic mono-cyclic moieties containing within the ring 1-3 heteroatoms independently selected from the group consisting of -O-, =N-, -N( $R_{10}$ )-, and -S-, and having 0-1 substituent selected from  $R_9$  and further having 0-3 substituents independently selected from F, Cl, Br, or I, or  $R_5$  is 9-membered fused-ring moieties having a 6-membered ring fused to a 5-membered ring and having the formula

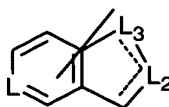


wherein  $L_1$  is O, S, or  $NR_{10}$ ,



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wherein L is  $CR_{12}$  or N,  $L_2$  and  $L_3$  are independently selected from  $CR_{12}$ ,  $C(R_{12})_2$ , O, S, N, or  $NR_{10}$ , provided that both  $L_2$  and  $L_3$  are not simultaneously O, simultaneously S, or simultaneously O and S, or



wherein L is CR<sub>12</sub> or N, and L<sub>2</sub> and L<sub>3</sub> are independently selected from CR<sub>12</sub>, O, S, N, or NR<sub>10</sub>, and each 9-membered fused-ring moiety having 0-1 substituent selected from R<sub>9</sub> and further having 0-3 substituent(s) independently selected from F, Cl, Br, or I, wherein the R<sub>5</sub> moiety attaches to other substituents as defined in formula I at any

5 position as valency allows;

R<sub>6</sub> is 6-membered heteroaromatic mono-cyclic moieties containing within the ring 1-3 heteroatoms selected from =N- and having 0-1 substituent selected from R<sub>9</sub> and 0-3 substituent(s) independently selected from F, Cl, Br, or I, or R<sub>6</sub> is 10-membered heteroaromatic bi-cyclic moieties containing within one or both rings 1-3

10 heteroatoms selected from =N-, including, but not limited to, quinolinyl or isoquinolinyl, each 10-membered fused-ring moiety having 0-1 substituent selected from R<sub>9</sub> and 0-3 substituent(s) independently selected from F, Cl, Br, or I, wherein the R<sub>6</sub> moiety attaches to other substituents as defined in formula I at any position as valency allows;

15 R<sub>7</sub> is alkyl, substituted alkyl, haloalkyl, -OR<sub>11</sub>, -CN, -NO<sub>2</sub>, -N(R<sub>8</sub>)<sub>2</sub>;

Each R<sub>8</sub> is independently H, alkyl, cycloalkyl, heterocycloalkyl, alkyl substituted with 1 substituent selected from R<sub>13</sub>, cycloalkyl substituted with 1 substituent selected from R<sub>13</sub>, heterocycloalkyl substituted with 1 substituent selected from R<sub>13</sub>, haloalkyl, halocycloalkyl, haloheterocycloalkyl, phenyl, or substituted

20 phenyl;

R<sub>9</sub> is alkyl, cycloalkyl, heterocycloalkyl, haloalkyl, halocycloalkyl, haloheterocycloalkyl, -OR<sub>14</sub>, -SR<sub>14</sub>, -N(R<sub>14</sub>)<sub>2</sub>, -C(O)R<sub>14</sub>, -C(O)N(R<sub>14</sub>)<sub>2</sub>, -CN, -NR<sub>14</sub>C(O)R<sub>14</sub>, -S(O)<sub>2</sub>N(R<sub>14</sub>)<sub>2</sub>, -NR<sub>14</sub>S(O)<sub>2</sub>R<sub>14</sub>, -NO<sub>2</sub>, alkyl substituted with 1-4 substituent(s) independently selected from F, Cl, Br, I, or R<sub>13</sub>, cycloalkyl substituted

25 with 1-4 substituent(s) independently selected from F, Cl, Br, I, or R<sub>13</sub>, or heterocycloalkyl substituted with 1-4 substituent(s) independently selected from F, Cl, Br, I, or R<sub>13</sub>;

R<sub>10</sub> is H, alkyl, haloalkyl, substituted alkyl, cycloalkyl, halocycloalkyl, substituted cycloalkyl, phenyl, or phenyl having 1 substituent selected from R<sub>7</sub> and

30 further having 0-3 substituents independently selected from F, Cl, Br, or I;

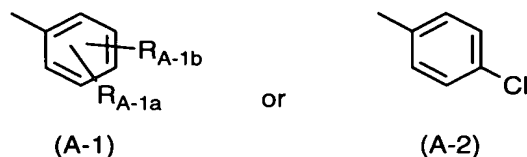
Each R<sub>11</sub> is independently H, alkyl, cycloalkyl, heterocycloalkyl, haloalkyl, halocycloalkyl, or haloheterocycloalkyl;

Each  $R_{12}$  is independently H, F, Cl, Br, I, alkyl, cycloalkyl, heterocycloalkyl, haloalkyl, halocycloalkyl, haloheterocycloalkyl, substituted alkyl, substituted cycloalkyl, substituted heterocycloalkyl, -CN, -NO<sub>2</sub>, -OR<sub>14</sub>, -SR<sub>14</sub>, -N(R<sub>14</sub>)<sub>2</sub>, -C(O)R<sub>14</sub>, -C(O)N(R<sub>14</sub>)<sub>2</sub>, -NR<sub>14</sub>C(O)R<sub>14</sub>, -S(O)<sub>2</sub>N(R<sub>14</sub>)<sub>2</sub>, -NR<sub>14</sub>S(O)<sub>2</sub>RR<sub>14</sub>, or a bond directly or indirectly attached to the core molecule, provided that there is only one said bond to the core molecule within the 9-membered fused-ring moiety, further provided that where valency allows the fused-ring moiety has 0-1 substituent selected from alkyl, cycloalkyl, heterocycloalkyl, haloalkyl, halocycloalkyl, haloheterocycloalkyl, substituted alkyl, substituted cycloalkyl, substituted heterocycloalkyl, -OR<sub>14</sub>, -SR<sub>14</sub>, -N(R<sub>14</sub>)<sub>2</sub>, -C(O)R<sub>14</sub>, -NO<sub>2</sub>, -C(O)N(R<sub>14</sub>)<sub>2</sub>, -CN, -NR<sub>14</sub>C(O)R<sub>14</sub>, -S(O)<sub>2</sub>N(R<sub>14</sub>)<sub>2</sub>, or -NR<sub>14</sub>S(O)<sub>2</sub>R<sub>14</sub>, and further provided that the fused-ring moiety has 0-3 substituent(s) selected from F, Cl, Br, or I;

$R_{13}$  is -OR<sub>14</sub>, -SR<sub>14</sub>, -N(R<sub>14</sub>)<sub>2</sub>, -C(O)R<sub>14</sub>, -C(O)N(R<sub>14</sub>)<sub>2</sub>, -CN, -CF<sub>3</sub>, -NR<sub>14</sub>C(O)R<sub>14</sub>, -S(O)<sub>2</sub>N(R<sub>14</sub>)<sub>2</sub>, -NR<sub>14</sub>S(O)<sub>2</sub>R<sub>14</sub>, or -NO<sub>2</sub>;

Each  $R_{14}$  is independently H, alkyl, cycloalkyl, heterocycloalkyl, haloalkyl, halocycloalkyl, or haloheterocycloalkyl;

wherein W is (A):



$R_{A-1a}$  is H, alkyl, alkenyl, alkynyl, cycloalkyl, heterocycloalkyl, haloalkyl, haloalkenyl, haloalkynyl, halocycloalkyl, haloheterocycloalkyl, substituted alkyl, substituted alkenyl, substituted alkynyl, substituted cycloalkyl, substituted heterocycloalkyl, aryl, -R<sub>5</sub>, R<sub>6</sub>, -OR<sub>A-3</sub>, -OR<sub>A-4</sub>, -SR<sub>A-3</sub>, F, Cl, Br, I, -N(R<sub>A-3</sub>)<sub>2</sub>, -N(R<sub>A-5</sub>)<sub>2</sub>, -C(O)R<sub>A-3</sub>, -C(O)R<sub>A-5</sub>, -CN, -C(O)N(R<sub>A-3</sub>)<sub>2</sub>, -C(O)N(R<sub>A-6</sub>)<sub>2</sub>, -NR<sub>A-3</sub>C(O)R<sub>A-3</sub>, -S(O)R<sub>A-3</sub>, -OS(O)<sub>2</sub>R<sub>A-3</sub>, -NR<sub>A-3</sub>S(O)<sub>2</sub>R<sub>A-3</sub>, -NO<sub>2</sub>, and -N(H)C(O)N(H)R<sub>A-3</sub>;

$R_{A-1b}$  is -O-R<sub>A-3</sub>, -S-R<sub>A-3</sub>, -S(O)-R<sub>A-3</sub>, -C(O)-R<sub>A-7</sub>, and alkyl substituted on the  $\omega$  carbon with R<sub>A-7</sub>;

Each  $R_{A-3}$  is independently selected from H, alkyl, haloalkyl, substituted alkyl, cycloalkyl, halocycloalkyl, substituted cycloalkyl, heterocycloalkyl,

haloheterocycloalkyl, substituted heterocycloalkyl,  $R_5$ ,  $R_6$ , phenyl, or substituted phenyl;

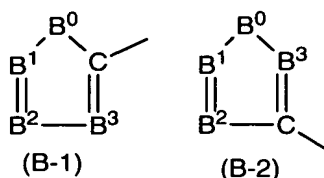
$R_{A-4}$  is selected from cycloalkyl, halocycloalkyl, substituted cycloalkyl, heterocycloalkyl, haloheterocycloalkyl, or substituted heterocycloalkyl;

5 Each  $R_{A-5}$  is independently selected from cycloalkyl, halocycloalkyl, substituted cycloalkyl, heterocycloalkyl, haloheterocycloalkyl, substituted heterocycloalkyl,  $R_5$ ,  $R_6$ , phenyl, or substituted phenyl;

Each  $R_{A-6}$  is independently selected from alkyl, haloalkyl, substituted alkyl, cycloalkyl, halocycloalkyl, substituted cycloalkyl, heterocycloalkyl, haloheterocycloalkyl, substituted heterocycloalkyl,  $R_5$ ,  $R_6$ , phenyl, or substituted phenyl;

$R_{A-7}$  is selected from aryl,  $R_5$ , or  $R_6$ ;

wherein W is (B):



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$B^0$  is -O-, -S-, or -N( $R_{B-0}$ )-;

$B^1$  and  $B^2$  are independently selected from =N-, or =C( $R_{B-1}$ )-;

$B^3$  is =N-, or =CH-, provided that when both  $B^1$  and  $B^2$  are =C( $R_{B-1}$ )- and  $B^3$  is =CH-, only one =C( $R_{B-1}$ )- can be =CH-, and further provided that when  $B^0$  is -O-,  $B^2$  is =C( $R_{B-1}$ )- and  $B^3$  is =C(H)-,  $B^1$  cannot be =N-,

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$R_{B-0}$  is H, alkyl, cycloalkyl, heterocycloalkyl, haloalkyl, halocycloalkyl, haloheterocycloalkyl, substituted alkyl, limited substituted alkyl, substituted cycloalkyl, substituted heterocycloalkyl, or aryl, and provided that when B is (B-2) and  $B^3$  is =N- and  $B^0$  is N( $R_{B-0}$ ),  $R_{B-0}$  cannot be phenyl or substituted phenyl;

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$R_{B-1}$  is H, alkyl, alkenyl, alkynyl, cycloalkyl, heterocycloalkyl, haloalkyl, haloalkenyl, haloalkynyl, halocycloalkyl, haloheterocycloalkyl, substituted alkyl, substituted alkenyl, substituted alkynyl, substituted cycloalkyl, substituted heterocycloalkyl, limited substituted alkyl, limited substituted alkenyl, limited substituted alkynyl, aryl, -OR<sub>B-2</sub>, -OR<sub>B-3</sub>, -SR<sub>B-2</sub>, -SR<sub>B-3</sub>, F, Cl, Br, I, -N( $R_{B-2}$ )<sub>2</sub>, -N( $R_{B-3}$ )<sub>2</sub>, -C(O)R<sub>B-2</sub>, -C(O)R<sub>B-3</sub>, -C(O)N( $R_{B-2}$ )<sub>2</sub>, -C(O)N( $R_{B-3}$ )<sub>2</sub>, -CN,

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$-\text{NR}_{\text{B}-2}\text{C}(\text{O})\text{R}_{\text{B}-4}$ ,  $-\text{S}(\text{O})_2\text{N}(\text{R}_{\text{B}-2})_2$ ,  $-\text{OS}(\text{O})_2\text{R}_{\text{B}-4}$ ,  $-\text{S}(\text{O})_2\text{R}_{\text{B}-2}$ ,  $-\text{S}(\text{O})_2\text{R}_{\text{B}-3}$ ,  
 $-\text{NR}_{\text{B}-2}\text{S}(\text{O})_2\text{R}_{\text{B}-2}$ ,  $-\text{N}(\text{H})\text{C}(\text{O})\text{N}(\text{H})\text{R}_{\text{B}-2}$ ,  $-\text{NO}_2$ ,  $\text{R}_5$ , and  $\text{R}_6$ ;

Each  $\text{R}_{\text{B}-2}$  is independently H, alkyl, haloalkyl, substituted alkyl, cycloalkyl, halocycloalkyl, substituted cycloalkyl, heterocycloalkyl, haloheterocycloalkyl,  
 5 substituted heterocycloalkyl,  $\text{R}_5$ ,  $\text{R}_6$ , phenyl, or substituted phenyl;

Each  $\text{R}_{\text{B}-3}$  is independently H, alkyl, haloalkyl, limited substituted alkyl, cycloalkyl, halocycloalkyl, substituted cycloalkyl, heterocycloalkyl, haloheterocycloalkyl, substituted heterocycloalkyl;

$\text{R}_{\text{B}-4}$  is independently H, alkyl, cycloalkyl, heterocycloalkyl, haloalkyl,  
 10 halocycloalkyl, or haloheterocycloalkyl;

wherein W is (C):

(C) is a six-membered heterocyclic ring system having 1-2 nitrogen atoms or a  
 10-membered bicyclic-six-six-fused-ring system having up to two nitrogen atoms  
 15 within either or both rings, provided that no nitrogen is at a bridge of the bicyclic-six-six-fused-ring system, and further having 1-2 substituents independently selected from  $\text{R}_{\text{C}-1}$ ;

Each  $\text{R}_{\text{C}-1}$  is independently H, F, Cl, Br, I, alkyl, haloalkyl, substituted alkyl, alkenyl, haloalkenyl, substituted alkenyl, alkynyl, haloalkynyl, substituted alkynyl,  
 20 cycloalkyl, halocycloalkyl, substituted cycloalkyl, heterocycloalkyl, haloheterocycloalkyl, substituted heterocycloalkyl, lactam heterocycloalkyl, phenyl, substituted phenyl,  $-\text{NO}_2$ ,  $-\text{CN}$ ,  $-\text{OR}_{\text{C}-2}$ ,  $-\text{SR}_{\text{C}-2}$ ,  $-\text{SOR}_{\text{C}-2}$ ,  $-\text{SO}_2\text{R}_{\text{C}-2}$ ,  $-\text{NR}_{\text{C}-2}\text{C}(\text{O})\text{R}_{\text{C}-3}$ ,  $-\text{NR}_{\text{C}-2}\text{C}(\text{O})\text{R}_{\text{C}-2}$ ,  $-\text{NR}_{\text{C}-2}\text{C}(\text{O})\text{R}_{\text{C}-4}$ ,  $-\text{N}(\text{R}_{\text{C}-2})_2$ ,  $-\text{C}(\text{O})\text{R}_{\text{C}-2}$ ,  $-\text{C}(\text{O})_2\text{R}_{\text{C}-2}$ ,  $-\text{C}(\text{O})\text{N}(\text{R}_{\text{C}-2})_2$ ,  $-\text{SCN}$ ,  $-\text{NR}_{\text{C}-2}\text{C}(\text{O})\text{R}_{\text{C}-2}$ ,  $-\text{S}(\text{O})\text{N}(\text{R}_{\text{C}-2})_2$ ,  $-\text{S}(\text{O})_2\text{N}(\text{R}_{\text{C}-2})_2$ ,  $-\text{NR}_{\text{C}-2}\text{S}(\text{O})_2\text{R}_{\text{C}-2}$ ,  $\text{R}_5$ , or  $\text{R}_6$ ;

Each  $\text{R}_{\text{C}-2}$  is independently H, alkyl, cycloalkyl, heterocycloalkyl, alkyl  
 25 substituted with 1 substituent selected from  $\text{R}_{\text{C}-5}$ , cycloalkyl substituted with 1 substituent selected from  $\text{R}_{\text{C}-5}$ , heterocycloalkyl substituted with 1 substituent selected from  $\text{R}_{\text{C}-5}$ , haloalkyl, halocycloalkyl, haloheterocycloalkyl, phenyl, or substituted phenyl;

Each  $\text{R}_{\text{C}-3}$  is independently H, alkyl, or substituted alkyl;

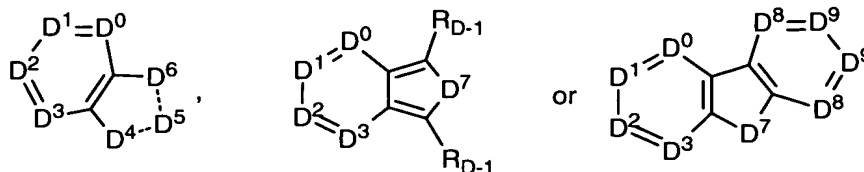
$\text{R}_{\text{C}-4}$  is H, alkyl, an amino protecting group, or an alkyl group having 1-3  
 substituents selected from F, Cl, Br, I,  $-\text{OH}$ ,  $-\text{CN}$ ,  $-\text{NH}_2$ ,  $-\text{NH}(\text{alkyl})$ , or  $-\text{N}(\text{alkyl})_2$ ;

$\text{R}_{\text{C}-5}$  is  $-\text{CN}$ ,  $-\text{CF}_3$ ,  $-\text{NO}_2$ ,  $-\text{OR}_{\text{C}-6}$ ,  $-\text{SR}_{\text{C}-6}$ ,  $-\text{N}(\text{R}_{\text{C}-6})_2$ ,  $-\text{C}(\text{O})\text{R}_{\text{C}-6}$ ,  $-\text{SOR}_{\text{C}-6}$ ,

$-\text{SO}_2\text{RR}_{\text{C-6}}$ ,  $-\text{C}(\text{O})\text{N}(\text{R}_{\text{C-6}})_2$ ,  $-\text{NR}_{\text{C-6}}\text{C}(\text{O})\text{R}_{\text{C-6}}$ ,  $-\text{S}(\text{O})_2\text{N}(\text{R}_{\text{C-6}})_2$ , or  $-\text{NR}_{\text{C-6}}\text{S}(\text{O})_2\text{R}_{\text{C-6}}$ ;

Each  $\text{R}_{\text{C-6}}$  is independently H, alkyl, cycloalkyl, heterocycloalkyl, haloalkyl, halocycloalkyl, or haloheterocycloalkyl;

5            wherein W is (D):



provided that the bond between the  $-\text{C}(=\text{X})-$  group and the W group may be attached at any available carbon atom within the D group as provided in  $\text{R}_{\text{D-1}}$ ,  $\text{R}_{\text{D-3}}$ , and  $\text{R}_{\text{D-4}}$ ;

$\text{D}^0$ ,  $\text{D}^1$ ,  $\text{D}^2$ , and  $\text{D}^3$  are N or  $\text{C}(\text{R}_{\text{D-1}})$  provided that up to one of  $\text{D}^0$ ,  $\text{D}^1$ ,  $\text{D}^2$ , or  $\text{D}^3$  is N and the others are  $\text{C}(\text{R}_{\text{D-1}})$ , further provided that when  $\text{C}(\text{X})$  is attached at  $\text{D}^2$  and  $\text{D}^0$  or  $\text{D}^1$  is N,  $\text{D}^3$  is  $\text{C}(\text{H})$ , and further provided that there is only one attachment to  $\text{C}(\text{X})$ ;

$\text{D}^4\text{---D}^5\text{---D}^6$  is selected from  $\text{N}(\text{R}_{\text{D-2}})\text{---C}(\text{R}_{\text{D-3}})=\text{C}(\text{R}_{\text{D-3}})$ ,  $\text{N}=\text{C}(\text{R}_{\text{D-3}})\text{---C}(\text{R}_{\text{D-4}})_2$ ,  $\text{C}(\text{R}_{\text{D-3}})=\text{C}(\text{R}_{\text{D-3}})\text{---N}(\text{R}_{\text{D-2}})$ ,  $\text{C}(\text{R}_{\text{D-3}})_2\text{---N}(\text{R}_{\text{D-2}})\text{---C}(\text{R}_{\text{D-3}})_2$ ,  $\text{C}(\text{R}_{\text{D-4}})_2\text{---C}(\text{R}_{\text{D-3}})=\text{N}$ ,  $\text{N}(\text{R}_{\text{D-2}})\text{---C}(\text{R}_{\text{D-3}})_2\text{---C}(\text{R}_{\text{D-3}})_2$ ,  $\text{C}(\text{R}_{\text{D-3}})_2\text{---C}(\text{R}_{\text{D-3}})_2\text{---N}(\text{R}_{\text{D-2}})$ ,  $\text{O}\text{---C}(\text{R}_{\text{D-3}})=\text{C}(\text{R}_{\text{D-3}})$ ,  $\text{O}\text{---C}(\text{R}_{\text{D-3}})_2\text{---C}(\text{R}_{\text{D-3}})_2$ ,  $\text{C}(\text{R}_{\text{D-3}})_2\text{---O}\text{---C}(\text{R}_{\text{D-3}})_2$ ,  $\text{C}(\text{R}_{\text{D-3}})=\text{C}(\text{R}_{\text{D-3}})\text{---O}$ ,  $\text{C}(\text{R}_{\text{D-3}})_2\text{---C}(\text{R}_{\text{D-3}})_2\text{---O}$ ,  $\text{S}\text{---C}(\text{R}_{\text{D-3}})=\text{C}(\text{R}_{\text{D-3}})$ ,  $\text{S}\text{---C}(\text{R}_{\text{D-3}})_2\text{---C}(\text{R}_{\text{D-3}})_2$ ,  $\text{C}(\text{R}_{\text{D-3}})_2\text{---S}\text{---C}(\text{R}_{\text{D-3}})_2$ ,  $\text{C}(\text{R}_{\text{D-3}})=\text{C}(\text{R}_{\text{D-3}})\text{---S}$ , or  $\text{C}(\text{R}_{\text{D-3}})_2\text{---C}(\text{R}_{\text{D-3}})_2\text{---S}$ ;

provided that when  $\text{C}(\text{X})$  is attached to W at  $\text{D}^2$  and  $\text{D}^6$  is O,  $\text{N}(\text{R}_{\text{D-2}})$ , or S,  $\text{D}^4\text{---D}^5$  is not  $\text{CH}=\text{CH}$ ;

and further provided that when  $\text{C}(\text{X})$  is attached to W at  $\text{D}^2$  and  $\text{D}^4$  is O,  $\text{N}(\text{R}_{\text{D-2}})$ , or S,  $\text{D}^5\text{---D}^6$  is not  $\text{CH}=\text{CH}$ ;

Each  $\text{R}_{\text{D-1}}$  is independently H, F, Br, I, Cl,  $-\text{CN}$ ,  $-\text{CF}_3$ ,  $-\text{OR}_{\text{D-5}}$ ,  $-\text{SR}_{\text{D-5}}$ ,  $-\text{N}(\text{R}_{\text{D-5}})_2$ , or a bond to  $\text{C}(\text{X})$  provided that only one  $\text{R}_{\text{D-1}}$  and no  $\text{R}_{\text{D-3}}$  or  $\text{R}_{\text{D-4}}$  is said bond,

Each  $\text{R}_{\text{D-2}}$  is independently H, alkyl, haloalkyl, substituted alkyl, cycloalkyl, halocycloalkyl, substituted cycloalkyl, heterocycloalkyl, haloheterocycloalkyl, substituted heterocycloalkyl,  $\text{R}_5$ , or  $\text{R}_6$ ;

Each  $R_{D-3}$  is independently H, F, Br, Cl, I, alkyl, substituted alkyl, haloalkyl, alkenyl, substituted alkenyl, haloalkenyl, alkynyl, substituted alkynyl, haloalkynyl, heterocycloalkyl, substituted heterocycloalkyl, lactam heterocycloalkyl, -CN, -NO<sub>2</sub>, -OR<sub>D-10</sub>, -C(O)N(R<sub>D-11</sub>)<sub>2</sub>, -NR<sub>D-10</sub>COR<sub>D-12</sub>, -N(R<sub>D-10</sub>)<sub>2</sub>, -SR<sub>D-10</sub>, -S(O)<sub>2</sub>R<sub>D-10</sub>,  
 5 -C(O)R<sub>D-12</sub>, -CO<sub>2</sub>R<sub>D-10</sub>, aryl, R<sub>5</sub>, R<sub>6</sub>, or a bond to C(X) provided that only one  $R_{D-3}$  and no  $R_{D-1}$  or  $R_{D-4}$  is also said bond;

Each  $R_{D-4}$  is independently H, F, Br, Cl, I, alkyl, substituted alkyl, haloalkyl, alkenyl, substituted alkenyl, haloalkenyl, alkynyl, substituted alkynyl, haloalkynyl, heterocycloalkyl, substituted heterocycloalkyl, lactam heterocycloalkyl, -CN, -NO<sub>2</sub>,  
 10 -OR<sub>D-10</sub>, -C(O)N(R<sub>D-11</sub>)<sub>2</sub>, -NR<sub>D-10</sub>COR<sub>D-12</sub>, -N(R<sub>D-11</sub>)<sub>2</sub>, -SR<sub>D-10</sub>, -CO<sub>2</sub>R<sub>D-10</sub>, aryl, R<sub>5</sub>, R<sub>6</sub>, or a bond to C(X) provided that only one  $R_{D-4}$  and no  $R_{D-1}$  or  $R_{D-3}$  is also said bond;

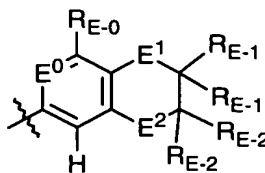
Each  $R_{D-5}$  is independently H, C<sub>1-3</sub> alkyl, or C<sub>2-4</sub> alkenyl;  
 $D^7$  is O, S, or N(R<sub>D-2</sub>);  
 15  $D^8$  and  $D^9$  are C(R<sub>D-1</sub>), provided that when C(X) is attached at a  $D^9$ , each  $D^8$  is CH;

Each  $R_{D-10}$  is H, alkyl, cycloalkyl, haloalkyl, substituted phenyl, or substituted naphthyl;

Each  $R_{D-11}$  is independently H, alkyl, cycloalkyl, heterocycloalkyl, alkyl  
 20 substituted with 1 substituent selected from R<sub>13</sub>, cycloalkyl substituted with 1 substituent selected from R<sub>13</sub>, heterocycloalkyl substituted with 1 substituent selected from R<sub>13</sub>, haloalkyl, halocycloalkyl, haloheterocycloalkyl, phenyl, or substituted phenyl;

$R_{D-12}$  is H, alkyl, substituted alkyl, cycloalkyl, haloalkyl, heterocycloalkyl,  
 25 substituted heterocycloalkyl, substituted phenyl, or substituted naphthyl;

wherein W is (E):



$E^0$  is CH or N;

$R_{E-0}$  is H, F, Cl, Br, I, alkyl, alkenyl, alkynyl, cycloalkyl, heterocycloalkyl, haloalkyl, haloalkenyl, haloalkynyl, halocycloalkyl, haloheterocycloalkyl, substituted alkyl, substituted alkenyl, substituted alkynyl, substituted cycloalkyl, substituted heterocycloalkyl, aryl,  $R_5$ ,  $R_6$ ,  $-OR_{E-3}$ ,  $-OR_{E-4}$ ,  $-SR_{E-3}$ ,  $-SR_{E-5}$ ,  $-N(R_{E-3})_2$ ,  $-NR_{E-3}R_{E-6}$ ,  
 5  $-N(R_{E-6})_2$ ,  $-C(O)R_{E-3}$ ,  $-CN$ ,  $-C(O)N(R_{E-3})_2$ ,  $-NR_{E-3}C(O)R_{E-3}$ ,  $-S(O)R_{E-3}$ ,  $-S(O)R_{E-5}$ ,  $-OS(O)_2R_{E-3}$ ,  $-NR_{E-3}S(O)_2R_{E-3}$ ,  $-NO_2$ , or  $-N(H)C(O)N(H)R_{E-3}$ ;

$E^1$  is O,  $CR_{E-1-1}$ , or  $C(R_{E-1-1})_2$ , provided that when  $E^1$  is  $CR_{E-1-1}$ , one  $R_{E-1}$  is a bond to  $CR_{E-1-1}$ , and further provided that at least one of  $E^1$  or  $E^2$  is O;

Each  $R_{E-1-1}$  is independently H, F, Br, Cl, CN, alkyl, haloalkyl, substituted  
 10 alkyl, alkynyl, cycloalkyl,  $-OR_E$ , or  $-N(R_E)_2$ , provided that at least one  $R_{E-1-1}$  is H when  $E^1$  is  $C(R_{E-1-1})_2$ ;

Each  $R_{E-1}$  is independently H, alkyl, substituted alkyl, haloalkyl, cycloalkyl, heterocycloalkyl, or a bond to  $E^1$  provided that  $E^1$  is  $CR_{E-1-1}$ ;

$E^2$  is O,  $CR_{E-2-2}$ , or  $C(R_{E-2-2})_2$ , provided that when  $E^2$  is  $CR_{E-2-2}$ , one  $R_{E-2}$  is a  
 15 bond to  $CR_{E-2-2}$ , and further provided that at least one of  $E^1$  or  $E^2$  is O;

Each  $R_{E-2-2}$  is independently H, F, Br, Cl, CN, alkyl, haloalkyl, substituted alkyl, alkynyl, cycloalkyl,  $-OR_E$ , or  $-N(R_E)_2$ , provided that at least one  $R_{E-2-2}$  is H when  $E^2$  is  $C(R_{E-2-2})_2$ ;

Each  $R_{E-2}$  is independently H, alkyl, substituted alkyl, haloalkyl, cycloalkyl,  
 20 heterocycloalkyl, or a bond to  $E^2$  provided that  $E^2$  is  $CR_{E-2-2}$ ;

Each  $R_E$  is independently H, alkyl, cycloalkyl, heterocycloalkyl, haloalkyl, halocycloalkyl, or haloheterocycloalkyl;

Each  $R_{E-3}$  is independently H, alkyl, haloalkyl, substituted alkyl, cycloalkyl, halocycloalkyl, substituted cycloalkyl, heterocycloalkyl, haloheterocycloalkyl,  
 25 substituted heterocycloalkyl,  $R_5$ ,  $R_6$ , phenyl, or phenyl having 1 substituent selected from  $R_9$  and further having 0-3 substituents independently selected from F, Cl, Br, or I or substituted phenyl;

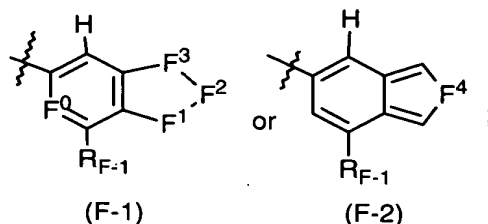
$R_{E-4}$  is H, haloalkyl, substituted alkyl, cycloalkyl, halocycloalkyl, substituted cycloalkyl, heterocycloalkyl, haloheterocycloalkyl, substituted heterocycloalkyl,  $R_5$ ,  
 30  $R_6$ , phenyl, or substituted phenyl;

Each  $R_{E-5}$  is independently H, haloalkyl, substituted alkyl, cycloalkyl, halocycloalkyl, substituted cycloalkyl, heterocycloalkyl, haloheterocycloalkyl, substituted heterocycloalkyl,  $R_5$ , or  $R_6$ ;



Each  $R_{E-6}$  is independently alkyl, haloalkyl, substituted alkyl, cycloalkyl, halocycloalkyl, substituted cycloalkyl, heterocycloalkyl, haloheterocycloalkyl, substituted heterocycloalkyl,  $R_5$ ,  $R_6$ , phenyl, or phenyl having 1 substituent selected from  $R_9$  and further having 0-3 substituents independently selected from F, Cl, Br, or I;

wherein W is (F):



$F^0$  is C(H), wherein  $F^1 \text{---} F^2 \text{---} F^3$  is selected from O-C( $R_{F-2}$ )=N, O-C( $R_{F-3}$ )( $R_{F-2}$ )-N( $R_{F-4}$ ), O-C( $R_{F-3}$ )( $R_{F-2}$ )-S, O-N=C( $R_{F-3}$ ), O-C( $R_{F-2}$ )( $R_{F-3}$ )-O, S-C( $R_{F-2}$ )=N, S-C( $R_{F-3}$ )( $R_{F-2}$ )-N( $R_{F-4}$ ), S-N=C( $R_{F-3}$ ), N=C( $R_{F-2}$ )-O, N=C( $R_{F-2}$ )-S, N=C( $R_{F-2}$ )-N( $R_{F-4}$ ), N( $R_{F-4}$ )-N=C( $R_{F-3}$ ), N( $R_{F-4}$ )-C( $R_{F-3}$ )( $R_{F-2}$ )-O, N( $R_{F-4}$ )-C( $R_{F-3}$ )( $R_{F-2}$ )-S, N( $R_{F-4}$ )-C( $R_{F-3}$ )( $R_{F-2}$ )-N( $R_{F-4}$ ), C( $R_{F-3}$ )<sub>2</sub>-O-N( $R_{F-4}$ ), C( $R_{F-3}$ )<sub>2</sub>-N( $R_{F-4}$ )-O, C( $R_{F-3}$ )<sub>2</sub>-N( $R_{F-4}$ )-S, C( $R_{F-3}$ )=N-O, C( $R_{F-3}$ )=N-S, C( $R_{F-3}$ )=N-N( $R_{F-4}$ ), or C( $R_{F-3}$ )<sub>2</sub>-C( $R_{F-2}$ )( $R_{F-3}$ )-C( $R_{F-3}$ )<sub>2</sub>; or

$F^0$  is N, wherein  $F^1 \text{---} F^2 \text{---} F^3$  is selected from O-C( $R_{F-2}$ )=N, O-C( $R_{F-3}$ )( $R_{F-2}$ )-N( $R_{F-4}$ ), O-C( $R_{F-3}$ )( $R_{F-2}$ )-S, O-N=C( $R_{F-3}$ ), O-C( $R_{F-2}$ )( $R_{F-3}$ )-O, S-C( $R_{F-2}$ )=N, S-C( $R_{F-3}$ )( $R_{F-2}$ )-N( $R_{F-4}$ ), S-N=C( $R_{F-3}$ ), N=C( $R_{F-2}$ )-O, N=C( $R_{F-2}$ )-S, N=C( $R_{F-2}$ )-N( $R_{F-4}$ ), N( $R_{F-4}$ )-N=C( $R_{F-3}$ ), N( $R_{F-4}$ )-C( $R_{F-3}$ )( $R_{F-2}$ )-O, N( $R_{F-4}$ )-C( $R_{F-3}$ )( $R_{F-2}$ )-S, N( $R_{F-4}$ )-C( $R_{F-3}$ )( $R_{F-2}$ )-N( $R_{F-4}$ ), C( $R_{F-3}$ )<sub>2</sub>-O-N( $R_{F-4}$ ), C( $R_{F-3}$ )<sub>2</sub>-N( $R_{F-4}$ )-O, C( $R_{F-3}$ )<sub>2</sub>-N( $R_{F-4}$ )-S, C( $R_{F-3}$ )=N-O, C( $R_{F-3}$ )=N-S, C( $R_{F-3}$ )=N-N( $R_{F-4}$ ), C( $R_{F-3}$ )=C( $R_{F-2}$ )-C( $R_{F-3}$ )<sub>2</sub>, or C( $R_{F-3}$ )<sub>2</sub>-C( $R_{F-2}$ )( $R_{F-3}$ )-C( $R_{F-3}$ )<sub>2</sub>;

$F^4$  is N( $R_{F-7}$ ), O, or S;

$R_{F-1}$  is H, F, Cl, Br, I, -CN, -CF<sub>3</sub>, -OR<sub>F-8</sub>, -SR<sub>F-8</sub>, or -N( $R_{F-8}$ )<sub>2</sub>;

$R_{F-2}$  is H, F, alkyl, haloalkyl, substituted alkyl, lactam heterocycloalkyl, phenoxy, substituted phenoxy,  $R_5$ ,  $R_6$ , -N( $R_{F-4}$ )-aryl, -N( $R_{F-4}$ )-substituted phenyl, -N( $R_{F-4}$ )-substituted naphthyl, -O-substituted phenyl, -O-substituted naphthyl, -S-substituted phenyl, -S-substituted naphthyl, or alkyl substituted on the  $\omega$  carbon with  $R_{F-9}$ ;

$R_{F-3}$  is H, F, Br, Cl, I, alkyl, substituted alkyl, haloalkyl, alkenyl, substituted alkenyl, haloalkenyl, alkynyl, substituted alkynyl, haloalkynyl, heterocycloalkyl, substituted heterocycloalkyl, lactam heterocycloalkyl, -CN, -NO<sub>2</sub>, -OR<sub>F-8</sub>,

-C(O)N(R<sub>F-8</sub>)<sub>2</sub>, -NHR<sub>F-8</sub>, -NR<sub>F-8</sub>COR<sub>F-8</sub>, -N(R<sub>F-8</sub>)<sub>2</sub>, -SR<sub>F-8</sub>, -C(O)R<sub>F-8</sub>, -CO<sub>2</sub>R<sub>F-8</sub>, aryl,

5  $R_5$ , or  $R_6$ ;

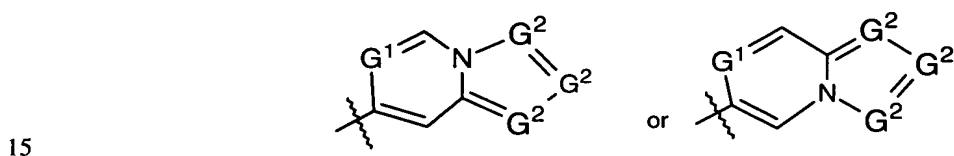
$R_{F-4}$  is H, or alkyl;

$R_{F-7}$  is H, alkyl, haloalkyl, substituted alkyl, cycloalkyl, halocycloalkyl, substituted cycloalkyl, phenyl, or phenyl having 1 substituent selected from  $R_9$  and further having 0-3 substituents independently selected from F, Cl, Br, or I;

10  $R_{F-8}$  is H, alkyl, substituted alkyl, cycloalkyl, haloalkyl, heterocycloalkyl, substituted heterocycloalkyl, substituted phenyl, or substituted naphthyl;

$R_{F-9}$  is aryl,  $R_5$ , or  $R_6$ ;

wherein W is (G):



$G^1$  is N or CH;

Each  $G^2$  is N or C(R<sub>G-1</sub>), provided that no more than one  $G^2$  is N, and further provided that when  $G^2$  adjacent to the bridge N is C(R<sub>G-1</sub>) and the other  $G^2$  are CH, that R<sub>G-1</sub> is other than H, F, Cl, I, alkyl, substituted alkyl or alkynyl;

20 Each R<sub>G-1</sub> is independently H, alkyl, substituted alkyl, haloalkyl, alkenyl, substituted alkenyl, haloalkenyl, alkynyl, substituted alkynyl, haloalkynyl, -CN, -NO<sub>2</sub>, F, Br, Cl, I, -C(O)N(R<sub>G-3</sub>)<sub>2</sub>, -N(R<sub>G-3</sub>)<sub>2</sub>, -SR<sub>G-6</sub>, -S(O)<sub>2</sub>R<sub>G-6</sub>, -OR<sub>G-6</sub>, -C(O)R<sub>G-6</sub>, -CO<sub>2</sub>R<sub>G-6</sub>, aryl,  $R_5$ ,  $R_6$ , or two R<sub>G-1</sub> on adjacent carbon atoms may combine for W to be a 6-5-6 fused-tricyclic-heteroaromatic-ring system optionally substituted on the  
25 newly formed ring where valency allows with 1-2 substituents independently selected from F, Cl, Br, I, and R<sub>G-2</sub>;

$R_{G-2}$  is alkyl, alkenyl, alkynyl, cycloalkyl, heterocycloalkyl, haloalkyl, haloalkenyl, haloalkynyl, halocycloalkyl, haloheterocycloalkyl, -OR<sub>G-8</sub>, -SR<sub>G-8</sub>, -S(O)<sub>2</sub>R<sub>G-8</sub>, -S(O)R<sub>G-8</sub>, -OS(O)<sub>2</sub>R<sub>G-8</sub>, -N(R<sub>G-8</sub>)<sub>2</sub>, -C(O)R<sub>G-8</sub>, -C(S)R<sub>G-8</sub>, -C(O)OR<sub>G-8</sub>,  
30 -CN, -C(O)N(R<sub>G-8</sub>)<sub>2</sub>, -NR<sub>G-8</sub>C(O)R<sub>G-8</sub>, -S(O)<sub>2</sub>N(R<sub>G-8</sub>)<sub>2</sub>, -NR<sub>G-8</sub>S(O)<sub>2</sub>R<sub>G-8</sub>, -NO<sub>2</sub>,

-N(R<sub>G-8</sub>)C(O)N(R<sub>G-8</sub>)<sub>2</sub>, substituted alkyl, substituted alkenyl, substituted alkynyl, substituted cycloalkyl, substituted heterocycloalkyl, lactam heterocycloalkyl, phenyl, phenyl having 0-4 substituents independently selected from F, Cl, Br, I and R<sub>G-7</sub>, naphthyl, or naphthyl having 0-4 substituents independently selected from F, Cl, Br, I, or R<sub>G-7</sub>;

Each R<sub>G-3</sub> is independently H, alkyl, cycloalkyl, heterocycloalkyl, alkyl substituted with 1 substituent selected from R<sub>G-4</sub>, cycloalkyl substituted with 1 substituent selected from R<sub>G-4</sub>, heterocycloalkyl substituted with 1 substituent selected from R<sub>G-4</sub>, haloalkyl, halocycloalkyl, haloheterocycloalkyl, phenyl, or substituted phenyl;

R<sub>G-4</sub> is -OR<sub>G-5</sub>, -SR<sub>G-5</sub>, -N(R<sub>G-5</sub>)<sub>2</sub>, -C(O)R<sub>G-5</sub>, -SOR<sub>G-5</sub>, -SO<sub>2</sub>R<sub>G-5</sub>, -C(O)N(R<sub>G-5</sub>)<sub>2</sub>, -CN, -CF<sub>3</sub>, -NR<sub>G-5</sub>C(O)R<sub>G-5</sub>, -S(O)<sub>2</sub>N(R<sub>G-5</sub>)<sub>2</sub>, -NR<sub>G-5</sub>S(O)<sub>2</sub>R<sub>G-5</sub>, or -NO<sub>2</sub>;

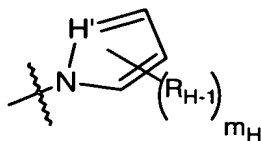
Each R<sub>G-5</sub> is independently H, alkyl, cycloalkyl, heterocycloalkyl, haloalkyl, halocycloalkyl, or haloheterocycloalkyl;

R<sub>G-6</sub> is H, alkyl, haloalkyl, substituted alkyl, cycloalkyl, halocycloalkyl, substituted cycloalkyl, phenyl, or phenyl having 0-4 substituents independently selected from F, Cl, Br, I, and R<sub>G-7</sub>;

R<sub>G-7</sub> is alkyl, substituted alkyl, haloalkyl, -OR<sub>G-5</sub>, -CN, -NO<sub>2</sub>, -N(R<sub>G-3</sub>)<sub>2</sub>;

Each R<sub>G-8</sub> is independently H, alkyl, haloalkyl, substituted alkyl, cycloalkyl, halocycloalkyl, substituted cycloalkyl, heterocycloalkyl, haloheterocycloalkyl, substituted heterocycloalkyl, phenyl, or phenyl substituted with 0-4 independently selected from F, Cl, Br, I, or R<sub>G-7</sub>;

wherein W is (H)



H' is N or CH;

Each R<sub>H-1</sub> is independently F, Cl, Br, I, -CN, -NO<sub>2</sub>, alkyl, haloalkyl, substituted alkyl, alkenyl, haloalkenyl, substituted alkenyl, alkynyl, haloalkynyl, substituted alkynyl, cycloalkyl, halocycloalkyl, substituted cycloalkyl,

heterocycloalkyl, haloheterocycloalkyl, substituted heterocycloalkyl, lactam

heterocycloalkyl, aryl,  $R_5$ ,  $R_6$ ,  $-OR_{H-3}$ ,  $-SR_{H-3}$ ,  $-SOR_{H-3}$ ,  $-SO_2R_{H-3}$ ,  $-SCN$ ,

$-S(O)N(R_{H-3})_2$ ,  $-S(O)_2N(R_{H-3})_2$ ,  $-C(O)R_{H-3}$ ,  $-C(O)_2R_{H-3}$ ,  $-C(O)N(R_{H-3})_2$ ,

$-C(R_{H-3})=N-OR_{H-3}$ ,  $-NC(O)R_{H-3}$ ,  $-NC(O)R_{H-3}$ ,  $-NC(O)R_{H-3}$ ,  $-N(R_{H-3})_2$ ,

- 5  $-NR_{H-3}C(O)R_{H-3}$ ,  $-NR_{H-3}S(O)_2R_{H-3}$ , or two  $R_{H-1}$  on adjacent carbon atoms may fuse to form a 6-membered ring to give a 5-6 fused, bicyclic moiety where the 6-membered ring is optionally substituted with 1-3 substituents selected from  $R_{H-2}$ ;

$m_H$  is 0, 1, or 2;

$R_{H-2}$  is alkyl, alkenyl, alkynyl, cycloalkyl, heterocycloalkyl, haloalkyl,

- 10 haloalkenyl, haloalkynyl, halocycloalkyl, haloheterocycloalkyl,  $-OR_{H-3}$ ,  $-SR_{H-3}$ ,  $-S(O)_2R_{H-3}$ ,  $-S(O)R_{H-3}$ ,  $-OS(O)_2R_{H-3}$ ,  $-N(R_{H-3})_2$ ,  $-C(O)R_{H-3}$ ,  $-C(S)R_{H-3}$ ,  $-C(O)OR_{H-3}$ ,  $-CN$ ,  $-C(O)N(R_{H-3})_2$ ,  $-NR_{H-3}C(O)R_{H-3}$ ,  $-S(O)_2N(R_{H-3})_2$ ,  $-NR_{H-3}S(O)_2R_{H-3}$ ,  $-NO_2$ ,  $-N(R_{H-3})C(O)N(R_{H-3})_2$ , substituted alkyl, substituted alkenyl, substituted alkynyl, substituted cycloalkyl, substituted heterocycloalkyl, lactam heterocycloalkyl, phenyl,
- 15 phenyl having 0-4 substituents independently selected from F, Cl, Br, I and  $R_7$ , naphthyl, naphthyl having 0-4 substituents independently selected from F, Cl, Br, I, or  $R_7$ , or two  $R_{H-2}$  on adjacent carbon atoms may combine to form a three-ring-fused-5-6-6 system optionally substituted with up to 3 substituents independently selected from Br, Cl, F, I,  $-CN$ ,  $-NO_2$ ,  $-CF_3$ ,  $-N(R_{H-3})_2$ ,  $-N(R_{H-3})C(O)R_{H-3}$ , alkyl, alkenyl, and
- 20 alkynyl;

Each  $R_{H-3}$  is independently H, alkyl, haloalkyl, substituted alkyl, cycloalkyl, halocycloalkyl, substituted cycloalkyl, heterocycloalkyl, haloheterocycloalkyl, substituted heterocycloalkyl, phenyl, or phenyl substituted with 0-4 independently selected from F, Cl, Br, I, or  $R_7$ ;

- 25 pharmaceutically acceptable salt, racemic mixture, or pure enantiomer thereof; and provided that the compound of Formula I includes at least one isotopic label.

2. The compound of claim 1, wherein  $R_2$  is H or  $CH_3$ , each  $R_3$  is H, and  $R_4$  is H.

- 30 3. The compound of claim 2, wherein W is 4-chlorobenz-1-yl; dibenzo[b,d]thiophene-2-yl; isoquinoline-3-yl; furo[2,3-c]pyridine-5-yl; 1,3-benzodioxole-5-yl; 2,3-dihydro-1,4-benzodioxine-6-yl; 1,3-benzoxazole-5-yl; thieno[2,3-c]pyridine-5-yl; thieno[3,2-c]pyridine-6-yl; [1]benzothieno[3,2-c]pyridine-

3-yl; 1,3-benzothiazole-6-yl; thieno[3,4-c]pyridine-6-yl; 2,3-dihydro-1-benzofuran-5-yl; 1-benzofuran-5-yl; furo[3,2-c]pyridine-6-yl; [1]benzothieno[2,3-c]pyridine-3-yl; dibenzo[b,d]furan-2-yl; 1-benzofuran-6-yl; 2-naphthyl; 1H-indole-6-yl; pyrrolo[1,2-c]pyrimidine-3-yl; 1-benzothiophene-5-yl; 1-benzothiophene-5-yl; 1-benzothiophene-6-yl; pyrrolo[1,2-a]pyrazine-3-yl; 1H-indole-6-yl; pyrazino[1,2-a]indole-3-yl; 1,3-benzothiazole-6-yl; [1]benzofuro[2,3-c]pyridine-3-yl; [1]benzofuro[2,3-c]pyridine-3-yl; 2H-chromene-6-yl; indolizine-6-yl; and [1,3]dioxolo[4,5-c]pyridine-6-yl; any of which is optionally substituted as allowed in claim 1.

4. The compound of claim 2, wherein W is thiophene-2-yl, furan-2-yl, pyrrole-2-yl, 1,3-oxazole-2-yl, 1,3-thiazole-2-yl, isoxazole-3-yl, isothiazole-3-yl; any of which is optionally substituted at the 5 position on the ring as allowed in formula I, and 1,3-oxazole-4-yl, 1,3-oxazole-5-yl, 1,3-thiazole-4-yl, 1,3-thiazole-5-yl; any of which is optionally substituted at the 2 position on the ring as allowed in claim 1.

15

5. The compound of claim 2, wherein the compound is:

N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-1-benzofuran-5-[<sup>11</sup>C]carboxamide;

N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-1-benzofuran-5-[<sup>11</sup>C]carboxamide;

20 N-[(3R,5R)-1-azabicyclo[3.2.1]oct-3-yl]-1-benzofuran-5-[<sup>11</sup>C]carboxamide;

N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-2-methyl-1-benzofuran-5-[<sup>11</sup>C]carboxamide;

N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-2-methyl-1-benzofuran-5-[<sup>11</sup>C]carboxamide;

25 N-[(3R,5R)-1-azabicyclo[3.2.1]oct-3-yl]-2-methyl-1-benzofuran-5-

[<sup>11</sup>C]carboxamide;

N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]furo[2,3-c]pyridine-5-[<sup>11</sup>C]carboxamide;

N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]furo[2,3-c]pyridine-5-

[<sup>11</sup>C]carboxamide;

30 N-[(2R)-7-azabicyclo[2.2.1]hept-2-yl]furo[2,3-c]pyridine-5-[<sup>11</sup>C]carboxamide;

N-[(3R,5R)-1-azabicyclo[3.2.1]oct-3-yl]furo[2,3-c]pyridine-5-

[<sup>11</sup>C]carboxamide;

N-[(3S)-1-azabicyclo[2.2.2]oct-3-yl]-3-methylfuro[2,3-c]pyridine-5-  
[<sup>11</sup>C]carboxamide;

N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-5-bromothiophene-2-[<sup>11</sup>C]carboxamide;  
5-bromo-N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]thiophene-2-

5 [<sup>11</sup>C]carboxamide;

N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-5-pyridin-2-ylthiophene-2-  
[<sup>11</sup>C]carboxamide;

N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-5-pyridin-2-ylthiophene-2-  
[<sup>11</sup>C]carboxamide;

10 N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-5-(methylthio)thiophene-2-  
[<sup>11</sup>C]carboxamide;

N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-5-(methylthio)thiophene-2-  
[<sup>11</sup>C]carboxamide;

N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-5-phenylthiophene-2-[<sup>11</sup>C]carboxamide;

15 N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-5-methoxythiophene-2-  
[<sup>11</sup>C]carboxamide;

N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-5-methoxythiophene-2-  
[<sup>11</sup>C]carboxamide;

N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-5-nitrothiophene-2-[<sup>11</sup>C]carboxamide;

20 N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-5-nitrothiophene-2-  
[<sup>11</sup>C]carboxamide;

N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-5-(2-[<sup>18</sup>F]fluorophenyl)-2-furamide;  
5-(2-[<sup>18</sup>F]fluorophenyl)-N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-2-  
furamide;

25 N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-4-[<sup>123</sup>I]iodo-1H-pyrazole-1-carboxamide;  
N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-4-[<sup>123</sup>I]iodo-1H-pyrazole-1-  
carboxamide;

N-[(3R,5R)-1-azabicyclo[3.2.1]oct-3-yl]-4-[<sup>123</sup>I]iodo-1H-pyrazole-1-  
carboxamide; or pharmaceutically acceptable salts thereof.

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6. The compound of claim 2, wherein the compound is

N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-1-benzofuran-5-[<sup>13</sup>C]carboxamide;

- N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-1-benzofuran-5-  
 [13C]carboxamide;
- N-[(3R,5R)-1-azabicyclo[3.2.1]oct-3-yl]-1-benzofuran-5-[13C]carboxamide;
- N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-2-methyl-1-benzofuran-5-  
 5 [13C]carboxamide;
- N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-2-methyl-1-benzofuran-5-  
 [13C]carboxamide;
- N-[(3R,5R)-1-azabicyclo[3.2.1]oct-3-yl]-2-methyl-1-benzofuran-5-  
 [13C]carboxamide;
- 10 N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]furo[2,3-c]pyridine-5-[13C]carboxamide;
- N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]furo[2,3-c]pyridine-5-  
 [13C]carboxamide;
- N-[(2R)-7-azabicyclo[2.2.1]hept-2-yl]furo[2,3-c]pyridine-5-[13C]carboxamide;
- N-[(3R,5R)-1-azabicyclo[3.2.1]oct-3-yl]furo[2,3-c]pyridine-5-  
 15 [13C]carboxamide;
- N-[(3S)-1-azabicyclo[2.2.2]oct-3-yl]-3-methylfuro[2,3-c]pyridine-5-  
 [13C]carboxamide;
- N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-5-bromothiophene-2-[13C]carboxamide;
- 5-bromo-N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]thiophene-2-  
 20 [13C]carboxamide;
- N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-5-pyridin-2-ylthiophene-2-  
 [13C]carboxamide;
- N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-5-pyridin-2-ylthiophene-2-  
 [13C]carboxamide;
- 25 N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-5-(methylthio)thiophene-2-  
 [13C]carboxamide;
- N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-5-(methylthio)thiophene-2-  
 [13C]carboxamide;
- N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-5-phenylthiophene-2-[13C]carboxamide;
- 30 N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-5-methoxythiophene-2-  
 [13C]carboxamide;
- N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-5-methoxythiophene-2-  
 [13C]carboxamide;

- N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-5-nitrothiophene-2-[<sup>13</sup>C]carboxamide;  
 N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-5-nitrothiophene-2-  
 [<sup>13</sup>C]carboxamide;
- N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-5-(2-[<sup>19</sup>F]fluorophenyl)-2-furamide;  
 5 5-(2-[<sup>19</sup>F]fluorophenyl)-N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-2-  
 furamide; or pharmaceutically acceptable salts thereof
7. A method for imaging and quantifying a compound of claim 1 in a subject,  
 wherein said compound in the subject is indicative of the presence of selective  
 10 nAChR in the subject.
8. The method of claim 7, wherein the compound is detected using position  
 emission topography.
- 15 9. The method of Claim 8, wherein the compound is  
 N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-1-benzofuran-5-[<sup>11</sup>C]carboxamide;  
 N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-1-benzofuran-5-  
 [<sup>11</sup>C]carboxamide;  
 N-[(3R,5R)-1-azabicyclo[3.2.1]oct-3-yl]-1-benzofuran-5-[<sup>11</sup>C]carboxamide;  
 20 N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-2-methyl-1-benzofuran-5-  
 [<sup>11</sup>C]carboxamide;  
 N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-2-methyl-1-benzofuran-5-  
 [<sup>11</sup>C]carboxamide;  
 N-[(3R,5R)-1-azabicyclo[3.2.1]oct-3-yl]-2-methyl-1-benzofuran-5-  
 25 [<sup>11</sup>C]carboxamide;  
 N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]furo[2,3-c]pyridine-5-[<sup>11</sup>C]carboxamide;  
 N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]furo[2,3-c]pyridine-5-  
 [<sup>11</sup>C]carboxamide;  
 N-[(2R)-7-azabicyclo[2.2.1]hept-2-yl]furo[2,3-c]pyridine-5-[<sup>11</sup>C]carboxamide;  
 30 N-[(3R,5R)-1-azabicyclo[3.2.1]oct-3-yl]furo[2,3-c]pyridine-5-  
 [<sup>11</sup>C]carboxamide;  
 N-[(3S)-1-azabicyclo[2.2.2]oct-3-yl]-3-methylfuro[2,3-c]pyridine-5-  
 [<sup>11</sup>C]carboxamide;



- N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-5-bromothiophene-2-[<sup>11</sup>C]carboxamide;  
 5-bromo-N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]thiophene-2-  
 [<sup>11</sup>C]carboxamide;
- N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-5-pyridin-2-ylthiophene-2-  
 5 [<sup>11</sup>C]carboxamide;
- N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-5-pyridin-2-ylthiophene-2-  
 [<sup>11</sup>C]carboxamide;
- N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-5-(methylthio)thiophene-2-  
 [<sup>11</sup>C]carboxamide;
- 10 N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-5-(methylthio)thiophene-2-  
 [<sup>11</sup>C]carboxamide;
- N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-5-phenylthiophene-2-[<sup>11</sup>C]carboxamide;
- N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-5-methoxythiophene-2-  
 [<sup>11</sup>C]carboxamide;
- 15 N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-5-methoxythiophene-2-  
 [<sup>11</sup>C]carboxamide;
- N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-5-nitrothiophene-2-[<sup>11</sup>C]carboxamide;
- N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-5-nitrothiophene-2-  
 [<sup>11</sup>C]carboxamide;
- 20 N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-5-(2-[<sup>18</sup>F]fluorophenyl)-2-furamide;  
 5-(2-[<sup>18</sup>F]fluorophenyl)-N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-2-  
 furamide; or pharmaceutically acceptable salts thereof.
10. The method of claim 8, wherein the compound is
- 25 N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-1-benzofuran-5-[<sup>11</sup>C]carboxamide;
- N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-1-benzofuran-5-  
 [<sup>11</sup>C]carboxamide;
- N-[(3R,5R)-1-azabicyclo[3.2.1]oct-3-yl]-1-benzofuran-5-[<sup>11</sup>C]carboxamide;
- N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-2-methyl-1-benzofuran-5-  
 30 [<sup>11</sup>C]carboxamide;
- N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-2-methyl-1-benzofuran-5-  
 [<sup>11</sup>C]carboxamide;

N-[(3R,5R)-1-azabicyclo[3.2.1]oct-3-yl]-2-methyl-1-benzofuran-5-  
[<sup>11</sup>C]carboxamide;

N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]furo[2,3-c]pyridine-5-[<sup>11</sup>C]carboxamide;

N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]furo[2,3-c]pyridine-5-  
5 [<sup>11</sup>C]carboxamide;

N-[(2R)-7-azabicyclo[2.2.1]hept-2-yl]furo[2,3-c]pyridine-5-[<sup>11</sup>C]carboxamide;

N-[(3R,5R)-1-azabicyclo[3.2.1]oct-3-yl]furo[2,3-c]pyridine-5-  
[<sup>11</sup>C]carboxamide;

N-[(3S)-1-azabicyclo[2.2.2]oct-3-yl]-3-methylfuro[2,3-c]pyridine-5-  
10 [<sup>11</sup>C]carboxamide; or pharmaceutically acceptable salts thereof.

11. The method of claim 7, wherein the compound is detected using single-photon  
emission computed tomography.

15 12. The method of claim 11, wherein the compound is  
N-[(3R)-1-azabicyclo[2.2.2]oct-3-yl]-4-[<sup>123</sup>I]iodo-1H-pyrazole-1-carboxamide;  
N-[(2S,3R)-2-methyl-1-azabicyclo[2.2.2]oct-3-yl]-4-[<sup>123</sup>I]iodo-1H-pyrazole-1-  
carboxamide;

N-[(3R,5R)-1-azabicyclo[3.2.1]oct-3-yl]-4-[<sup>123</sup>I]iodo-1H-pyrazole-1-  
20 carboxamide; or pharmaceutically acceptable salts thereof.

13. The method of claims 7, wherein the subject is a human patient.

14. The method of claim 7, wherein the detectably labeled compound comprises a  
25 moiety selected from the group consisting of <sup>11</sup>C, <sup>18</sup>F, <sup>76</sup>Br, <sup>123</sup>I and <sup>125</sup>I.

15. The method of claims 7, wherein the disease is Alzheimer's disease,  
neurodegeneration associated with diseases such as Alzheimer's disease, pre-senile  
dementia (mild cognitive impairment), senile dementia, Parkinson's disease or  
30 schizophrenia.

16. The method of claim 7, wherein the disease is psychosis, attention deficit disorder, attention deficit hyperactivity disorder, depression, anxiety, general anxiety disorder, post traumatic stress disorder, or mood and affective disorders.

5 17. The method of claim 7, wherein the disease is amyotrophic lateral sclerosis, borderline personality disorder, traumatic brain injury, or behavioral and cognitive problems in general and associated with brain tumors.

18. The method of claim 7, wherein the disease is AIDS dementia complex,  
10 dementia associated with Down's syndrome, dementia associated with Lewy Bodies, Huntington's disease, tardive dyskinesia, Pick's disease, dysregulation of food intake including bulimia and anorexia nervosa, withdrawal symptoms associated with smoking cessation and dependant drug cessation, Gilles de la Tourette's Syndrome, age-related macular degeneration, glaucoma, neurodegeneration associated with  
15 glaucoma, diabetic retinopathy, or symptoms associated with pain.